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Research Paper

Effect of fly ash and FYM on yield of groundnut and nutrient concentration and uptake by groundnut in vertisol

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ABSTRACT

A field experiment was conducted to study the effect of Fly ash and FYM on yield of groundnut and nutrient concentration and uptake by groundnut in Vertisol at Maradhwada Agriculture University, Parbhani in 1997-98. The study revealed that, the pod yield and haulm yield of groundnut increased favorably with increasing leads of fly ash and FYM *i.e.* addition of 30 t ha^{-1} of fly ash gave maximum yields as compared to yields obtained due to lower levels of fly ash and it was highest with the application of 30 t ha^{-1} of FYM. The nitrogen content in pod and haulm was decreased with the application of 30 t ha^{-1} fly ash while it resulted in increase in phosphorus and potassium content and FYM application @ 30 t ha^{-1} showed maximum concentration and uptake of nitrogen, phosphorus and potassium in pod and haulm of groundnut. The pod and haulm yield showed favourable increase with the application of increasing levels of fly ash and FYM whereas the test wt. (100grain yield) of groundnut was non–significantly affected by fly ash and FYM.

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Key words : Fly ash, FYM, NPK, Groundnut, Vertisol

INTRODUCTION

Fly ash is obtained as a waste or byproduct of thermal power station when pulverized coal in burnt for generation of electricity. India continued to be XIth largest producer of coal in the world. Coal is a back bone of energy production in India. Its non utilization for production of only value based industrial product leads to its accumulation over the years on the cultivable land near the TPP. A modern 200 megawatt capacity generation unit produces 2 tons of fly ash per minute. It has been estimated that for disposing 5.5.million tones of fly ash per annum, the total disposal cost would be over rupees fifty million. This will create disposal and ecological problems in addition to use of land for dumping it. In Maharashtra there are ten TPS, out of this plant Parli-vaijanath is situated in Marathwada region (M.S.) where the 56.98 per cent land is occupied by ash bunds. At this tpp, it is observed that the more land has to be left for storage of fly ash. This may pose problem of acquiring more and more arable land in future. For this problem need to be addernal on priority of finding cost a solution for disposal or rather utilization of fly ash.

As the fly ash is a amorphous ferroaluminosilicate mineral after the major matrix elements being Si, Al and Ti, (Sharma *et al.,* 1986) fly ash consists approximately 95 to 99 per cent of oxides of Na, P, K and S. It was observed that fly ash application correlate boron deficiency of alfalfa. A similar finding was reported for correlation potassium deficiency of corn. The fly ash have been reported to be strongly alkaline in reaction and also found to be good liming materials for acid soil (Hedgson *et al.*, 1982). The fire texture of fly ash and the presence of several natural elements in it have reflected on number of important physico-chemical properties of soil from the point of view of crop production (Adrine *et al.*,1980).

Groundnut is an oilseed crop. From several year it is cultivated by the farmer of Marathwada region. It is an traditional crop of Marathwada region. The increasing price fertilizer limits fertilizer use among the poor farming community. This situation leads to decrease in soil fertility and productivity. Besides natural supply, improvement of physical properties and infiltration rates need to be addressed the use of fly ash. With this facts in view, the present investigation was undertaken to find out suitability of fly ash for improving natural status of vertisol and consequently in boosting the yield of groundnut.

MATERIALS AND METHODS

The field experiment was conducted during *Kharif* season of 1997-98 on the Farm of Department of Agronomy, MAU, Parbhani. The experimental plot soil was medium in fertility, black in colour and about 90 cm deep with clayey texture of the soil was placed under order vertisol. Suborder ustants of grate group of chromosterts and included in Perbhani soil series. The soil sample from 0.25 cm depth was used for initial analysis and the plant samples were collected at harvesting stage. The experiment conducted with groundnut (varietys B-11) with three levels of fly ash *viz*., 10, 20, 30 tonnes ha^{-1}, corresponding to 32, 38, 64 kg $plot^{-1}$ and three levels of FYM *viz*., 10, 20, 30 tonnes ha^{-1}, corresponding to 32, 64, 96 kg plot -1 and one treatment as control for both. Thus 7 treatments were replicated thrice in simple randomized block design which consisted of 21 plots.

The experimental land was ploughed upto 30 cm deep with tractor plough and subsequent harrowing was carried out. The fly ash, FYM and fertilizer were applied as per treatment and mixed in soil thoroughly in each recommended plot. Full dose of N,P and K fertilizer (25:50:50) was applied at the time of the sowing through area, SSP and MOP, respectively. All the intercultural operation carried out timely. The soil samples were collected at 30, 60, 90 days of interval and analyzed for available NPK as per standard procedure (Jackson, 1973) and the plant samples were collected at harvesting stage. The pod and haulm yield were also taken at the maturity and data were statistically analyzed.

RESULTS AND DISCUSSION

The results obtained from the present investigation are presented below :

Effect Fly ash and FYM on pod and haulm yield and test weight of groundnut:

The significant result were obtained in case of pod and haulm yield of groundnut (Table 1) due to the application of increasing levels of fly ash and FYM. The pod and haulm yield of groundnut increased significantly over control and the highest yield values were recorded with the application of fly ash 30 t/ha^{-1} which may be ascribed to the substantial nutrient supply during the crop growth and favourable effect on improvement in physical properties of soil. The increased yield groundnut due to fly ash application was also reported by Matte and Kene (1995). The increasing yield results of pod and haulm of groundnut were obtained with increasing levels of FYM application and it was highest with application of FYM 30 t/ha^{-1}. This increase in yield may due to increase in decomposed organic matter and presence of growth regulating factor like hormones and enzymes in FYM. The similar results were also reported by Somani and Sexena (1975). The yield results of groundnut pod and haulm increased due to application of increasing levels of fly ash may be attributed to over all improvement in soil physical and physio-chemical environment of the clayey soils which could have led to the better nutrition and growth of crop. Similar results were obtained by Matte and Thakare (1994).

Effect of fly ash and FYM on nutrients content (per cent) in pod and haulm of groundnut:

The fly ash addition with increasing levels (10,20 and 30 $/ha^{-1}$) showed (Table 2) the decreased nitrogen content while it showed increase in the phosphorus and potassium content in pod and haulm of groundnut. The above result of higher P and K content may be due to the favourable effect produced by fly ash and supply of these nutrient to

Table 1 : Mean pod and haulm yield and test weight of groundnut as influenced by varying levels of fly ash and FYM

Treatments	Pod yield (q ha^{-1})	Haulm yield (q ha^{-1})	Test weight (100 grain wt.) (g)
T_1	13.1	48.12	43.23
T_2	14.55	50.49	43.26
T_3	15.10	53.00	43.31
T_4	15.90	55.20	43.33
T_5	17.67	62.77	43.30
T_6	20.10	70.35	43.49
T_7	22.70	79.45	43.54
S.E. +	0.32	0.88	0.62
C.D. (P=0.05)	0.99	2.73	NS

Table 2 : NPK content (%) and uptake (Kg ha^{-1}) in pod and haulm of groundnut as influenced by varying levels of fly ash and FYM

Treatments	NPK content (%) in pod and haulm						NPK uptake (Kg ha^{-1}) in pod and haulm					
	N content		P content		K content		N uptake		P uptake		K uptake	
	Pod	Haulm	Pod	Haulm	Pod	Haulm	Pod	Haulm	Pod	Haulm	Pod	Haulm
T_1	3.15	1.70	0.57	0.11	2.20	1.61	41.26	81.80	7.55	5.66	28.89	77.68
T_2	3.25	1.75	0.61	0.12	2.25	1.65	47.28	89.29	8.98	6.51	32.69	84.35
T_3	3.24	1.74	0.62	0.13	2.35	1.72	49.18	92.44	9.51	7.12	35.60	90.97
T_4	3.21	1.72	0.63	0.13	2.41	1.73	51.04	94.42	10.02	7.45	38.27	95.52
T_5	3.53	1.75	0.64	0.13	2.44	1.75	62.54	109.84	11.41	8.59	43.27	109.84
T_6	3.55	1.76	0.66	0.14	2.54	1.77	71.35	123.88	13.34	9.84	51.06	124.87
T_7	3.58	1.76	0.67	0.14	2.67	1.80	81.38	139.99	15.36	11.12	60.75	143.07
S.E. $\pm$	0.18	1.14	0.019	0.008	0.13	0.11	0.68	2.37	0.21	0.19	0.53	2.10
C.D. (P=0.05)	0.54	0.45	0.058	0.025	0.40	0.34	2.10	7.29	0.68	0.60	1.63	6.52

the growing crop.

In case of FYM application with increasing levels (10, 20 and 30 t ha^{-1}) showed increased N, P and K content in pod and haulm of groundnut and highest increase N, P and K content in pod and haulm of groundnut was recorded with higher application of FYM *i.e.*, 30 t ha-1. This increase of nutrient content may be due to significant effect of FYM and supply of these nutrients to the growing crop.

Effect of flay ash and FYM on uptake (kg ha^{1}) of N,P,K nutrients in pod and haulm of groundnut:

N, P and K uptake in pod and haulm of groundnut was studied (Table 2) and it was found to be increased with the increasing (10.20 and 30 t ha^{-1}) levels of fly ash. This effect was probably due to improved supply of P and K to the growing crop and increased yield of the crop.

The FYM addition with increasing levels (10, 20 and 30 t. ha $^{-1}$) also recorded increased uptake of N, P and K in pod and haulm of groundnut and the highest uptake was recorded with the application of FYM (30 t. ha^{-1}) which probably was due to the favourable effect of FYM on improving the physical and chemical properties of soil leading to optimum availability of nutrients and increased the crop yield. Yadav and Singh (1978) and Yadav *et al.* (1991) also recorded similar result of FYM on nutrient uptake.

Conclusion:

The pod and haulm yield of groundnut was found to be increased and the N, P and K uptake in pod and haulm of groundnut also recorded maximum due to application of fly ash and FYM @ 30 t ha^{-1}.

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